Sheep Pox and Goat Pox

Importance
Sheep and goat pox are contagious viral skin diseases. These diseases may be mild in indigenous breeds from endemic areas, but are often fatal in newly introduced animals. Pox infections can limit trade, export, and the development of intensive livestock production. They may also prevent new breeds of sheep or goats from being imported into endemic regions.

Etiology
Sheep pox and goat pox result from infection by members of the *Capripox* genus in the family Poxviridae. Most isolates cause disease mainly in sheep or mainly in goats; some isolates can cause serious disease in both species. The causative viruses cannot be distinguished from each other with current techniques. Only one serotype exists.

Species affected
Sheep and goat poxviruses cause disease only in these two species. Infections have not been seen in wild ungulates.

Geographic distribution
Sheep pox and goat pox are found in central and north Africa, central Asia, the Middle East, and parts of the Indian subcontinent.

Transmission
Sheep and goat poxviruses are usually transmitted by the respiratory route, but may also enter the body through abraded skin. Most animals become infected while they are in close contact with infected sheep or goats. Infectious virus is found in all secretions, excretions, and the scabs from skin lesions. Contagious aerosols may also be generated from dust that contains pox scabs. These viruses can be spread on fomites and are probably transmitted mechanically by insects. Chronically infected carriers are not seen.

Sheep and goat poxviruses can remain infectious for up to six months in sheep pens. These viruses may also be found on the wool or hair for as long as three months after infection.

Incubation period
The incubation period is 8 to 13 days in most natural infections, but may be as short as 4 days.

Clinical signs
The first sign of infection is a fever, followed 2 to 5 days later by erythematous macules that develop into 0.5 to 1.5 cm hard papules. The centers of the papules are initially edematous but become depressed, gray, and necrotic, and surrounded by an area of hyperemia. Fluid-filled vesicles have been seen over the lesions but are rare. Dark, hard, sharply demarcated scabs eventually form and may take up to six weeks to heal. Skin

lesions can be restricted to the axilla, perineum, and groin or may cover the body. In animals with heavy wool, the lesions can be easier to find by palpation than visual inspection. Mild infections can easily be missed; only a few lesions may be present, often around the ears or the tail.

Systemic signs may include conjunctivitis, rhinitis, lymphadenopathy, depression, and a variable degree of blepharitis. Anorexia is sometimes present if the mucous membranes are involved. Lung lesions can cause dyspnea. The mucous membranes can become necrotic and animals may develop a mucopurulent nasal or ocular discharge. Secondary bacterial infections are common and death can occur at any stage of the disease. Some European breeds of sheep die before the characteristic skin lesions appear.

Post mortem lesions

The skin usually contains macules and papules, with areas of edema, hemorrhage, congestion, necrosis, and vasculitis. The papules penetrate through both the dermis and epidermis; in severe cases, they may extend into the musculature. The lungs often contain discrete congested or edematous lesions or hard white nodules. Papules or ulcerated papules are common on the abomasal mucosa. They may also be found on the rumen, large intestine, trachea, esophagus, tongue, and hard or soft palate. Pale foci are sometimes present on the surface of the kidney, liver, and testicles. The lymph nodes are usually swollen and the mucous membranes may be necrotic.

Morbidity and Mortality

Morbidity and mortality vary with the breed of the host and the strain of the virus. Disease is usually more severe in young animals. Mild infections are common in indigenous breeds; however, symptoms may be more severe in kids or lambs, stressed animals, animals that have concurrent infections, or animals from areas where pox has not occurred for some time. Imported breeds of sheep and goats usually develop severe disease when they are moved into an endemic area. Mortality may be up to 50% in a fully susceptible flock and as high as 100% in young animals.

Infection results in good immunity. Vaccines are available in some areas.

Diagnosis

Clinical

Sheep or goat pox should be suspected in animals with the characteristic full-thickness skin lesions, fever, and lymphadenitis. Dyspnea may also be seen.

Differential diagnosis

The differential diagnosis includes contagious ecthyma (contagious pustular dermatitis), bluetongue, mycotic dermatitis, sheep scab, mange, photosensitization, peste des petits ruminants, parasitic pneumonia, and caseous lymphadenitis.

Laboratory tests

Sheep or goat pox can be tentatively diagnosed by electron microscopy; the morphology of the virus particle is characteristic. The causative viruses can be isolated in lamb testis

or kidney cell cultures or in other sheep, goat, or bovine cell lines. Identification is by immunofluorescence or immunoperoxidase staining.

An agar gel immunodiffusion (AGID) test or enzyme-linked immunosorbent assay (ELISA) can detect virus antigens. Cross-reactions occur in the AGID test with parapoxvirus. A polymerase chain reaction (PCR) technique has also been reported.

Antibodies can be found one week after the skin lesions appear. Serologic tests include virus neutralization, agar gel immunodiffusion, indirect immunofluorescence, ELISA, and immunoblotting (Western blotting). Virus neutralization is the most specific serological test, but is not sensitive enough to detect infections in all animals. Cross-reactions with other viruses are seen in the AGID and indirect immunofluorescence tests.

Samples to collect

Before collecting or sending any samples from animals with a suspected foreign animal disease, contact the AVIC. These samples should only be sent under secure conditions, by authorized personnel, and to authorized laboratories to prevent the spread of disease.

Skin biopsies should be taken for virus isolation and antigen detection. In live animals, virus can also be isolated from blood samples or lymph nodes. Samples taken at necropsy should include the skin, lymph nodes and lung lesions. Neutralizing antibodies can interfere with virus isolation or antigen-detection ELISAs; samples for these tests must be collected during the early stages of infection. Blood samples must be sent to the laboratory within two days and, ideally, as soon as possible. They should be shipped on wet ice or gel packs. Tissues for virus isolation, antigen detection, or PCR should be kept at 4° C or -20° C. Glycerol (10%) can be added to tissue samples that must be shipped long distances without refrigeration; these samples must be large enough that the medium does not penetrate into the center of the tissue.

Serum should be collected for serology. Samples for histology should include skin (with a wide range of lesions) from live animals and a full set of tissues at necropsy. Lesions from the skin, rumen, lungs, and trachea are particularly useful.

Recommended actions if sheep or goat pox is suspected

Notification of authorities

Sheep or goat pox must be reported immediately to state or federal authorities. Federal: Area Veterinarians in Charge (AVICS) http://www.aphis.usda.gov/vs/area_offices.htm
State vets: http://www.aphis.usda.gov/vs/sregs/official.html

Quarantine and Disinfection

A limited outbreak of sheep or goat pox can sometimes be controlled by depopulating infected and exposed animals, cleaning and disinfecting affected farms and equipment, and imposing a quarantine on animal movement. Sodium hypochlorite is an effective disinfectant. When the disease has spread more widely, vaccination may also be required.

Public health
Sheep and goat pox viruses do not appear to infect humans.

For More Information
World Organization for Animal Health (OIE)
http://www.oie.int

OIE Manual of Standards
http://www.oie.int/eng/normes/mmanual/a_summry.htm

OIE International Animal Health Code
http://www.oie.int/eng/normes/mcode/A_summry.htm

USAHA Foreign Animal Diseases book
http://www.vet.uga.edu/vpp/gray_book/FAD/

Animal Health Australia. The National Animal Health Information System (NAHIS)
http://www. aahc.com.au/nahis/disease/dislist.asp

References
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